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(54) Title: ICE CREAM MIX AND METHOD OF MANUFACTURING SAME

(57) Abstract

A frozen dessert mix has the following composition: 12-22 % by weight total fat, wherein a relatively greater portion of said total fat is added to said composition as cream, and a relatively lesser portion of said fat is added to said composition as butter or cocoa butter; 2-8 % by weight egg yolk; 10-20 % by weight sweetener; 0-12 % by dry weight basis of skim milk or skim milk powder; 0-12 % by weight corn solids; balance water. A unique process for producing this composition involves cooking a blended mixture of the above ingredients at a temperature between 190 °F and 200 °F, for a time ranging from about 1 to about 10 minutes.

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ICE CREAM MIX AND METHOD OF MANUFACTURING SAME

BACKGROUND OF THE INVENTION

1. Field of the Invention

Frozen dessert mixes are the object of the present invention. In particular, the invention concerns a cooked liquid mix that can be whipped and then frozen to make ice cream, without the need for using a ice cream freezer as in the prior art.

2. Description of Prior Art

Conventional processes for making ice cream involve simultaneously whipping and rapidly freezing an approximately equal volume of air into a formulated ice cream mix. This process requires the use of continuous freezers that provide rapid freezing as well as control of air incorporation (overrun) and drawing temperature.

More particularly, the continuous freezers used for conventional manufacturing of ice cream rapidly whip the ice cream mix with rotating mutator and ice scraper blades, while the mix is simultaneously chilled to -4° to -7°C.

As described for example in WONG et al., Fundamentals of Dairy Chemistry (Third Edition, 1988), pages 744-747, the above processing conditions are necessary to ensure that ice crystals forming within the product ice cream will be kept

at a size not more than 50 microns in diameter, while air cells of about 175 microns in diameter will be formed within the ice cream. These characteristics are necessary to give the ice cream a smooth texture and optimum body.

Federal standards for ice cream, available from the American Dairy Science Association, dictate various aspects of the composition of ice cream. Notable among these are that ice cream must contain a minimum of 20% total milk solids, a minimum of 10% milk fat, and a maximum of 1.4% egg yolk solids (all composition percentages given in the present specification are by weight, unless otherwise noted).

Due to the above-described manufacturing constraints, ice cream is not normally made outside of specialized facilities for ice cream manufacture. In particular, general-purpose food service institutions as well as individual consumers are typically reluctant to invest in the specialized equipment needed to make ice cream according to the conventional techniques.

U.S. patent No. 4,663,176 describes a frozen mousse and a method of making the same, in which egg yolks are used as a natural emulsifier to aid in blending the chocolate or other cacao fat containing ingredient into the composition. The process described in this application emphasizes the need to incorporate the water content of the composition in two stages. The product of this patent cannot be characterized as an ice cream, because its milk solids content is too low (i.e., less than 20%), and also because its egg yolk solids

content will normally be too high (i.e., more than 1.4%). This patent also emphasizes that the composition must contain not more than about 3% of milk solids not fat (MSNF).

Despite the use of egg yolks as an emulsifier in the composition of U.S. patent No. 4,663,176, the examples reveal that a continuous ice cream freezer was necessary to produce the final product, as in the conventional techniques described above.

U.S. patents Nos. 4,346,120 and 4,374,154 provide additional examples of prior art frozen dessert products, which differ in material respects from the composition according to the present invention.

OBJECTS OF THE INVENTION

It is therefore a principal object of the invention to provide a frozen dessert mix which can be whipped up to form a final product without the need for continuous ice cream freezers as in the prior art, thereby providing a product suited to more widespread use by consumers and throughout the food service industry.

It is a further object of the invention to provide a frozen dessert formulation as described above, which satisfies the federal standards defining an ice cream.

It is a still further object of the invention to provide frozen dessert mixes which can be whipped up to form a stable emulsion, which will remain in the whipped state sufficiently long to be frozen by conventional all-purpose freezing appliances.

It is a yet still further object of the invention to devise a process for producing a frozen dessert mix having the characteristics identified in the above-enumerated objects of the invention.

SUMMARY OF THE INVENTION

The above and other objects according to the present invention are achieved by a frozen dessert mix having the following general composition:

total fat: 12-22%, with a greater portion of that fat preferably originating from cream, and a lesser portion preferably originating from butter or cocoa butter;

egg yolk: 2-8%;

sweetener: 10-30%;

skim milk powder: 0-12%;

corn solids: 0-12%;

balance water.

The invention also provides a unique process for producing the above-described composition, which ensures that the composition will have the desired processing characteristics. According to that process, the fully blended composition is cooked at a temperature between 190°F and 200°F, for a time ranging from 1-10 minutes.

It has been found that the frozen dessert mix according to the invention can be repeatedly thawed and refrozen without ice crystallization and without loss of volume or water.

It has also been found that the frozen dessert mix according to the invention can be stored and shipped at temperatures of -10 to 0°F, without any thawing or water evacuation. Moreover, the frozen dessert mix according to the invention can be shipped at high altitudes, without occurrence of water evacuation.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS OF THE INVENTION

In the description that follows, it will be appreciated that the weight percent ranges of various of the ingredients, as well as the nature of the ingredients themselves, will vary somewhat depending on whether the mix is a so-called "white" mix, or a chocolate mix. For example, in either type of mix, it is desirable that a larger portion of the total fat content be a relatively softer fat from a source such as fresh cream, and a smaller portion of the total fat content be a relatively harder fat. In the case of a white mix, however, the relatively harder fat will preferably be provided by butter, whereas in a chocolate milk the relatively harder fat will preferably be supplied as chocolate liquor or another suitable source of cocoa butter.

In the case of either type of mix, any of various flavorings may be added as desired to the formulated mix composition, without in any way altering the basic and novel character of the invention. Indeed, a chocolate-flavored mix according to the invention may be produced simply by adding a chocolate flavoring to a white mix of the type described

below, without the need for separately formulating a chocolate mix, as will also be described below.

Thus, where the composition according to the invention is said to "consist essentially of" a list of ingredients in specified weight percent ranges, it will be appreciated that such list remains open to whatever flavorings, colorings, fruits and/or nuts as may be desired to improve the taste and appearance of the composition, without in any way departing from the essential novelty of the invention.

The mix according to the invention is a perishable liquid at room temperature, and so must be kept either frozen or refrigerated until it is desired to whip it up to form the final product.

The inventive mix will produce a rather rich ice cream product, owing to its relatively high fat content in the range of 12-22% by weight. More preferably, the total fat content of the present mix will be in the range from 15-19% by weight, and the most preferred fat content at present is about 18% by weight.

Of the total fat content, a relatively greater amount will be a softer fat from a source such as cream, and a relatively lesser amount will be of a harder fat from a source such as butter or cocoa butter. In the case of using butter as a source of harder fat, the butter will preferably be used in an amount of about 4-10% by weight (80% of which will typically be fat), with sufficient cream being added to

the composition to bring the total fat content to the figures recited above.

In this regard, it should be noted that fat from butter and fat from cream are conventionally referred to collectively as "butter fat"; however, those skilled in the art know that fat from butter is different in nature than fat from cream, due to the breaking of the oil-in-water milk fat emulsion that occurs during the butter-making process.

Where the relatively harder fat in the mix is cocoa butter, it will preferably be supplied in the form of chocolate liquor in an amount from about 3 to about 8% by weight, preferably 4-7% by weight and most preferably 5.6% by weight. Chocolate liquor typically contains about 52-54% by weight cocoa butter. It will be recognized by those skilled in the art that other sources of cocoa butter could equally be used, such as semi-sweet chocolate, or naturally processed or Dutch processed cocoa, or mixtures of these.

The composition according to the invention will also contain egg yolks, in an amount from about 2 to about 8% by weight, preferably from about 3 to about 7% by weight, most preferably about 4% by weight. The form of egg yolks preferred for use in the invention are sugared frozen egg yolks, which naturally must be thawed prior to incorporation in the mix. These egg yolks have about 45% total solids (some portion of which is egg yolk solids, some portion of which is sugar). In order to keep the total egg yolk solids at or

below the federally-prescribed maximum, it is preferred that the amount of egg yolk not greatly exceed about 4% by weight.

It has been found that the combination of egg yolk and the relatively harder fat component described above, in conjunction with the unique processing conditions to be discussed below, produces a mix that can be whipped up to form a stable emulsion and thereafter frozen, without the need for continuous ice cream freezers and deep freezing equipment, as in the prior art.

A sweetening agent will also be added to the composition according to the invention, for its conventional purpose of improving the taste of the final product. The sweetener will preferably be largely sucrose, with a smaller amount of corn syrup solids. The sweetener could of course be all sucrose, but it is preferred to include a smaller amount of corn solids as a filler to achieve the best possible texture of the product.

The amount of sweetener will be from about 10 to about 30% by weight. In the case of a so-called "white" mix, the mix will preferably contain from about 10 to about 16% cane sugar, more preferably 11-15%, and most preferably about 13%. In the case of a chocolate mix, the amount of cane sugar is desirably somewhat greater to counteract the inherent bitterness of chocolate, and is preferably 15-25%, more preferably 16-24%, and most preferably about 19% by weight.

In the case of either a white or chocolate mix, the composition will contain from about 0 to about 12% corn solids, preferably 4-10%, and most preferably 6-8% by weight.

The composition according to the invention will also normally contain a source of milk solids not fat (MSNF), preferably from skim milk powder (also called non-fat dry milk). The amount of the skim powder ingredient will range from 0-12% by weight. In the case of a white mix, this amount will normally be in the range from 3-12% by weight, more preferably 4-10%, and most preferably about 8%; whereas in the case of a chocolate mix, the amount of skim powder will be in the range from 0-8% by weight, more preferably 0-6%, and most preferably about 2.4% by weight.

It will be appreciated that the total amount of MSNF in the compositions will normally be considerably in excess of 4% by weight, whether the composition is a white mix or a chocolate mix. The reason for the use of less skim powder in the chocolate mix is that cacao fat is harder than fat from butter, such that correspondingly more cream is normally used in the chocolate mix in order to achieve the desired total fat content. Thus, less skim powder is needed to provide a comparable overall MSNF content. In the case of a white mix, the MSNF content will preferably be at least 6% by weight, more preferably 8-12% by weight, and most preferably about 10% by weight.

As an example of the cream to be used in the composition according to the invention, there can be mentioned

commercially-available cream having a fat content of about 40%, which cream has total solids in an amount of about 45% by weight.

Other suitable sources of the relatively softer fat component include 36% cream (cream containing 36% milk fat). The cream may be fresh, frozen or reconstituted.

The process for producing the frozen dessert mix according to the invention will now be described. It will be appreciated from the following description that the process is itself a new invention when performed on a composition such as that described above, because it imparts characteristics to the composition which would not be present in a composition having the same amounts of ingredients but prepared in a different manner.

The process according to the invention begins by combining the water and sugar, together with the corn syrup solids and skim milk powder (if any) in a mixing vessel, preferably such as a pasteurizing vat having an agitator for completely blending the ingredients.

For simplicity, it is preferred to add all of the water in this first step of the process, as it is not necessary to add the water in two or more stages, according to the present method.

These ingredients are then dissolved by heating them in the mixing vessel under relatively vigorous agitation. In particular, it is preferred to heat the ingredients to a temperature within the range of 105-125°F, for a time within

that range from about 3 to about 15 minutes, while maintaining high agitation. Of course, these numerical parameters are dependent only on the primary objective of dissolving the sugar, corn syrup solids and skim powder in the water.

After the first dry ingredients are dissolved, the thawed frozen egg yolks will be added to the mixing vessel, followed by agitation to dissolve the yolks. It has been found that high agitation for a period of about 10 minutes is sufficient to dissolve the yolks.

According to the invention, the temperature of the thus-mixed ingredients is then raised to a temperature within the range of about 130-170°F, preferably about 150°F. If desired, the egg yolks can be agitated into the mixture while the mixture is being raised to this temperature; however, it is preferred to dissolve the egg yolks prior to raising the mixture to this temperature.

Once the mixture has attained the desired temperature within the range of 130-170°F, the harder fat component (for example butter and/or chocolate liquor) is added to the mixture, which mixture is then held at that temperature with high agitation for a period from about 5 to 15 minutes, more preferably 8-10 minutes.

After the harder fat component is fully dissolved, the softer fat component (typically in the form of fresh 40% cream) is added to the mixture. The large volume of the cream and its much lower temperature causes the temperature of the

mixture to drop at this point to a temperature within the range of about 60-90°F, usually 70-80°F.

At this stage, all of the essential ingredients are present in the composition, and it is fully blended. The composition is then pasteurized. Pasteurization in the process according to the invention may be done in the manner as is conventional for ice cream mixes, namely by heating to at least 175°F for at least 25 seconds, or at least 155°F for at least 30 minutes. Owing to the relatively viscous nature of the ice cream mix according to the invention, however, it is presently preferred to heat the composition to a temperature within the range from about 175°F to about 185°F, for about 20 minutes, in order to effect pasteurization.

There is next performed a particularly important and innovative processing step according to the method of the present invention. After pasteurization is complete, the pasteurized composition is next further heated to a temperature in excess of 190°F, within the range of 190-200°F, for a time period from 2-9 minutes. It is preferred to heat the composition at this stage to a temperature within the range of 193-197°F for a time from 3-8 minutes; and at present, it is most preferred to heat the composition to a temperature of about 195°F for a time of from 4 to a maximum of 5 minutes. If the composition is heated too high and/or for too long at this stage, the milk and egg proteins become denatured and the product loses its desirable properties.

The above further heating step has been found especially important in producing a mix that forms a stable emulsion upon whipping with equipment that does not simultaneously freeze the emulsion. If this further heating step is not performed, it has been found that the nature of the resulting composition is considerably different than that produced when the further heating step is performed. In particular, the resulting product does not form nearly so stable or long-lasting an emulsion if this further heating step has not first been performed.

It will therefore be appreciated from the foregoing description that the frozen dessert mix according to the invention is one which can be accurately characterized as cooked, rather than merely pasteurized.

After this further heating step, the composition is homogenized while still hot, using standard homogenizing equipment at about 35 kg/cm^2 to about 210 kg/cm^2. This homogenization performs the conventional function of subdividing milk fat globules to sizes believed to range from 0.5-2 microns in diameter, and contributes to the aeration properties of the mix upon whipping.

The essential processing of the mix according to the invention is now complete, and it is loaded into a refrigerated storage tank. It is preferred, but not essential, to agitate the product within the refrigerated tank for at least two hours, as this has been found to result in a "drier" ice cream when the mix is subsequently whipped.

There will now be described by way of non-limiting example the preparation of a batch of white mix according to the present invention:

Example

2000 lbs of White Mix

Ingredient	Weight Percent	lbs.	Fat (lbs.)	Solids (lbs.)	Milk Solids (lbs.)
Butter	5.0	100	80	80	80
Cane sugar	13.0	260	---	260	---
Corn syrup solids	9.0	180	---	180	---
Frozen egg yolk	4.0	80	20	36	---
40% cream	37.5	750	300	338	338
Skim milk powder	7.0	140	---	140	140
Water	24.5	490	---	---	---
Totals	100.0	2000	400	1034	578

An ice cream mix having the above composition was made by adding the water, cane sugar, corn syrup solids and skim milk powder into a pasteurizing vat equipped with an agitator and a heating jacket. The ingredients were then simultaneously agitated and heated until the temperature reached 115°F, and the temperature was held at that level for about 5-10 minutes until the dry ingredients were completely dissolved.

Next, the thawed frozen egg yolk was added into the vat and the agitator turned on to dissolve the yolks. When the yolks were dissolved, the temperature was raised to 150°F and held there for 10 minutes.

With the temperature still being held at 150°F, the butter was added and agitation was performed for 8-10 minutes to dissolve the butter into the composition.

The cream was then added, which, due to its lower temperature and large amount, caused the temperature of the mixture to drop to about 75°F. The contents of the vat were then heated to 185°F, and that temperature was held for 20 minutes to pasteurize the composition.

Next, the fully blended composition was heated to 195°F for about 4½ minutes. It is this step which has been found especially important to producing a mix that forms a stable emulsion upon subsequent whipping.

The composition was then homogenized while still hot, and allowed to cool. It was then placed in a refrigerated storage tank and agitated for about 2½ hours.

The composition is now ready for use. It is preferred to freeze the composition in storage containers of any desired size, ranging from the size of an individual portion up to 10 and 15-pound tubs, and thaw the composition when it is desired to whip it up to form a final product.

The mix according to the invention is as perishable as any other dairy product, and so must at a minimum be kept under refrigeration.

To produce a final ice cream product using the mix according to the invention, it is necessary only to whip the thawed mix composition at below 50°F, preferably from 40-50°F, and thereafter freeze the resulting emulsion.

It is preferable to use a whipper in which the amount of introduced air can be controlled, such as an Oaks-type whipper; however, it is possible to use less sophisticated whipping equipment, even a hand-held blender such as is found in many homes.

After the mix is whipped up to form a stable emulsion, the emulsion will remain stable at room temperature for 30-40 minutes, after which time the emulsion begins to become very soft and to collapse.

On the other hand, if the whipped up emulsion is refrigerated at a temperature from 40-50°F, it will remain stable for 3-4 days.

Thanks to the unique stability of the emulsion produced by whipping the mix according to the invention, the final ice cream product can be produced by freezing the emulsion in ordinary all-purpose freezers, including those designed purely for domestic use. It is certainly not necessary to use a hardening tunnel at temperatures of -20° to -35°C, as in the prior art techniques for producing ice cream.

Indeed, the mix according to the invention forms so stable an emulsion that there has been found to be virtually no formation of ice crystals of any size upon repeated freezing and thawing of the product ice cream. Thus, one of the major problems of ice cream manufacture and storage is entirely avoided by the process and product according to the invention.

Although the present invention has been described in detail in connection with various preferred embodiments thereof, it will be appreciated that many modifications of the process and product as disclosed will be readily apparent to those skilled in the art, after a reading of the present specification. The invention should therefore not be strictly limited to the numerical parameters set forth in the accompanying claims, but rather should be construed to include minor variations therefrom which nevertheless rely on the essential teaching of the invention.

What is claimed is:

1. A composition for producing a frozen dessert, said composition comprising an intimate admixture of the following ingredients:

12-22% by weight total fat, wherein a relatively greater portion of said total fat is added to said composition as cream, and a relatively lesser portion of said fat is added to said composition as butter or cocoa butter;

2-8% by weight egg yolk;

10-20% by weight sweetener;

0-12% by dry weight basis of skim milk or skim milk powder;

0-12% by weight corn solids;

balance water;

wherein said composition is a liquid at room temperature and is whippable at temperatures above freezing, but not above about 50°F, to form a stable emulsion.

2. The composition according to claim 1, wherein said composition contains from about 14 to about 18% by weight of said total fat, said relatively lesser portion of said total fat being added to said composition as about 4 to about 10% by weight butter, from about 3 to about 7% of said egg

yolk, from about 11 to about 16% by weight of said sweetener in the form of cane sugar, from about 4 to about 10% dry weight basis of said skim milk or skim milk powder, and from about 4 to about 10% by weight of said corn solids.

3. The composition according to claim 1, comprising from about 14 to about 18% by weight of said total fat, wherein said relatively lesser portion of said total fat is added to said composition as from about 1.5 to about 4% by weight cocoa butter, from about 3 to about 7% by weight egg yolk, from about 16 to about 24% by weight sweetener in the form of cane sugar, at least about 2.4% by dry weight basis skim milk or skim milk powder, and from about 4 to about 10% by weight corn solids.

4. The composition according to claim 1, wherein said total fat includes greater than 10% by weight butterfat and greater than 20% by weight total milk solids.

5. A process for producing a frozen dessert mix having the following composition:

14-20% by weight total fat, wherein a relatively greater portion of said total fat is added to said composition as cream, and a relatively lesser portion of said fat is added to said composition as butter or cacao fat;

2-8% by weight egg yolk;

10-20% by weight sweetener;

0-12% by dry weight basis of skim milk or skim milk powder;

0-12% by weight corn solids;

balance water;

comprising the steps of dissolving said total fat, egg yolk, sweetener, skim milk or skim milk powder, and corn solids into said water to form a blended mixture, and cooking said blended mixture at a temperature between 190°F and 200°F, for a time ranging from about 1 to about 10 minutes.

6. The process according to claim 5, wherein said cooking is performed for a time period from about 2 to about 9 minutes.

7. The process according to claim 5, wherein said cooking is performed at a temperature from about 193 to about 197°F for a time from about 3 to about 8 minutes.

8. The process according to claim 5, wherein said cooking is performed at a temperature of about 195°F for a time from about 4 to a maximum of about 5 minutes.

9. The process according to claim 5, wherein, prior to said cooking step, said blended mixture is pasteurized at a temperature from about 155°F to about 185°F, for a time of at least 25 seconds but not exceeding about 30 minutes.

10. The process according to claim 5, further comprising the step of whipping said composition to form a stable emulsion, and freezing said emulsion to produce a frozen dessert.

11. A frozen dessert mix produced by the process of claim 5.

12. A frozen dessert produced by the process of claim 10.

INTERNATIONAL SEARCH REPORT

Internat' Application No
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A. CLASSIFICATION OF SUBJECT MATTER

A 23 G 9/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A 23 G 9/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US, A, 4 663 176 (S. ARDEN) 05 May 1987 (05.05.87), examples; claims	1
A	examples; claims (cited in the application).	2-12
A	EP, A1, 0 509 509 (LOTTE CO.) 21 October 1992 (21.10.92), totality.	2-12
A	US, A, 4 434 186 (N. DESIA et al.) 28 February 1984 (28.02.84), examples.	1-12

☐ Further documents are listed in the continuation of box C.

☐ Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
06 July 1994	22. 07. 94

Name and mailing address of the ISA	Authorized officer
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ANHANG

zum internationalen Recherchenbericht über die internationale Patentanmeldung Nr.

ANNEX

to the International Search Report to the International Patent Application No.

ANNEXE

au rapport de recherche international relatif à la demande de brevet international n°

PCT/US 94/02816 SAE 88105

In diesem Anhang sind die Mitglieder der Patentfamilien der im obengenannten internationalen Recherchenbericht angeführten Patentdokumente angegeben. Diese Angaben dienen nur zur Unterrichtung und erfolgen ohne Gewähr.

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Im Recherchenbericht angeführtes Patentdokument Patent document cited in search report Document de brevet cité dans le rapport de recherche	Datum der Veröffentlichung Publication date Date de publication	Mitglied(er) der Patentfamilie Patent family member(s) Membre(s) de la famille de brevets	Datum der Veröffentlichung Publication date Date de publication
US A 4663176	05-05-87	keine - none - rien	
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